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(54) SHIELD MATERIAL FOR FLAT CABLE AND FLAT CABLE WITH SHIELD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a flat cable with shield in which the shield layer and adhesive layer of the shield material are improved, and conduction of the shield layer and a ground wire is easy and can be done stably, and which has fire-resistance and excellent shield characteristics.

SOLUTION: A conductive and fire-resistant adhesive layer 13 is formed on the insulating substrate 11 made of PET or the like using a heat seal resin composite containing a conductive filler 14 and a fire-resistant filler 15, and, thereby, a flexible shield material for a flat cable 1 of film shape is manufactured. The shield material 1 obtained has conductivity in its adhesive layer, and, thus, by overlapping the shield material on the flat cable and by heating and pressurizing, the shield layer and the ground wire can be conducted, hence, the work efficiency is much improved.



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CLAIMS

[Claim(s)]

[Claim 1] Shielding material for flat cables characterized by having formed the metal thin film layer in one side of an electric insulation base material, and forming the glue line which has conductivity and fire retardancy using the resin constituent containing a conductive filler and a fire-resistant filler in the resin constituent which uses as a principal component the thermoplastics which has heat-sealing nature on this metal thin film layer.

[Claim 2] Shielding material for flat cables according to claim 1 to which the glue line which has said conductivity and fire retardancy is characterized by containing the fire-resistant filler for the conductive filler 20 to 50% of the weight ten to 30% of the weight.

[Claim 3] That said conductive filler is spherical or shielding material for flat cables according to claim 1 or 2 characterized by consisting of a grain-like carbon particle.

[Claim 4] Shielding material for flat cables according to claim 1 to 3 characterized by for said electric insulation base material being a polyethylene terephthalate film, and said metal thin film layer being the vacuum-plating-of-aluminium film with a thickness of 0.04-0.2 micrometers.

[Claim 5] The flat cable with shielding characterized by having unified the shielding material for flat cables according to claim 1 to 4 by heating to a flat cable and pressurizing it, and giving a shielding function to a flat cable.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Industrial Application] This invention relates to the flat cable with shielding which used the shielding material for flat cables (electromagnetic wave electric shielding nature film etc.), and it. Especially, as it can carry out by improving the shielding layer and glue line of shielding material, and a flow with a shielding layer and a grand line being easy, and stabilizing it, the flat cable with shielding excellent in the shielding property is offered.

[0002]

[Description of the Prior Art] Recently, instead of horizontal volume shielding wire or a coaxial line, the flat cable is used for the signal transmission of the interface in equipments, such as a transmitter, a computer, and a peripheral device, and between equipment. However, in the environment which various electric waves, an electromagnetic wave, etc. generate like today, a flat cable is influenced [these] and causes [of the computer] incorrect actuation more often.

[0003] Therefore, in order to protect a flat cable from an electromagnetic wave, various kinds of shielding techniques for covering so that the electromagnetic wave generated from a flat cable may not affect other devices are developed. For example, in order to use a metallic foil for the shielding layer of shielding material and to paste up the metallic foil with a flat cable, what prepared the insulating adhesives layer in the front face of a metallic foil is used. Moreover, the adhesives which added conductive matter, such as metal powder, are applied to a plastics film, and the shielding material which used the electroconductive glue layer as the shielding layer is also examined. Moreover, the shielding material which formed the electroconductive glue layer which added conductive matter, such as metal powder, to the metallic foil, and was used as the shielding layer is also examined.

[0004] Moreover, as what has a good sliding property, after forming a metal thin film on a base philharmonic, the electromagnetic wave shielding film in which the adhesive resin layer containing a silver granule child and/or a copper grain child was formed is proposed (JP,7-94036,A). This shielding tape becomes expensive when the silver granule child contains in the adhesive resin layer, although it excels in conductivity and electromagnetic wave shielding becomes good, since it has a metal thin film, and when using a copper grain child, lowering of a with-time shielding property poses a problem.

[0005] Moreover, the silver vacuum evaporatio film is formed in a base film as a metal thin film, and the electromagnetic wave shielding film which made the adhesive resin layer contain a nickel filler is proposed (JP,11-120831,A). since a metal thin film is silver vacuum evaporatio film, this shielding tape also has an expensive base film at a fire-resistant engineering plastic. Furthermore, in order to give fire retardancy to a plastics film, what used fire-resistant engineering plastics, such as polyphenylene sulfide, polyamidoimide, polyether imide, and polyarylate, is indicated as a plastics film.

[0006]

[Problem(s) to be Solved by the Invention] Since the shielding material which prepared the insulating adhesives layer in the front face of a metallic foil made it flow through the grand line of a shielding layer and a flat cable, it excises a part of insulating adhesives layer, exposed the grand line, and needed to excise a part of shielding material, needed to expose the metallic foil, and needed to make it flow through the grand line and metallic foil (shielding layer) which were exposed by the special processing approaches, such as spot welding. Moreover, since it was inferior to flexibility when a metallic foil is used, constraint arose in wearing of a flat cable, and constraint had appeared in the configuration of an electronic member.

[0007] Moreover, although the problem of workability and the problem of the configuration of an electronic member are solved since, as for the shielding material which prepared the electroconductive glue layer in

the plastics film, flexibility becomes good in order to solve the above-mentioned technical problem, there is a problem that a shielding property is inferior, as compared with the shielding material using a metallic foil. Furthermore, in order to give fire retardancy to shielding material, when fire-resistant engineering plastics, such as polyphenylene sulfide, polyamidoimide, polyether imide, and polyarylate, are used, since cost is high, shielding material becomes cost high and an economical problem produces these fire-resistant engineering plastics.

[0008]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as a result of inquiring wholeheartedly, the configuration of the shielding material for flat cables and the flat cable with shielding using it was performed as follows. That is, it is considered as the shielding material for flat cables characterized by having formed the metal thin film layer in one side of an electric insulation base material for the shielding material for flat cables, and forming the glue line which has conductivity and fire retardancy using the resin constituent containing a conductive filler and a fire-resistant filler in the resin constituent which uses as a principal component the thermoplastics which has heat-sealing nature on this metal thin film layer. Moreover, the glue line which has said conductivity and fire retardancy which were formed in the electric insulation base material is considered as the shielding material for flat cables characterized by containing the fire-resistant filler for the conductive filler 20 to 50% of the weight ten to 30% of the weight. And said conductive filler is considered as spherical or the shielding material for flat cables characterized by consisting of a grain-like carbon particle.

[0009] Moreover, in said shielding material for flat cables, it is considered as the shielding material for flat cables characterized by for an electric insulation base material being a polyethylene terephthalate film, and a metal thin film layer being the vacuum-plating-of-aluminium film with a thickness of 0.04-0.2 micrometers.

[00010] Furthermore, the shielding material for flat cables of the above-mentioned configuration was unified by heating to a flat cable and pressurizing it, and it is considered as the flat cable with shielding characterized by giving a shielding function to a flat cable.

[0011] Namely, the shielding material for flat cables of this invention On one side of electric insulation base materials, such as a polyethylene terephthalate (it outlines Following PET) film and a polyimide film Metal thin film layers, such as vacuum-plating-of-aluminium film, are formed. On this metal thin film layer The thermoplastics which has heat-sealing nature, for example, polyethylene, polypropylene, polyester, etc. to the resin constituent used as a principal component Conductive fillers, such as metal powder and carbon powder, The glue line which has an adhesive resin layer, i.e., conductivity, and fire retardancy by coating etc. is formed using the resin constituent which added fire-resistant fillers, such as an aluminum hydroxide and a magnesium hydroxide, and it is considered as the supplementary shielding material for flat cables.

[0012] And into the glue line which has said conductivity and fire retardancy, while conductivity is acquired by the glue line of the shielding material for flat cables by making a fire-resistant filler contain a conductive filler 20 to 50% of the weight ten to 30% of the weight, fire retardancy is given. Moreover, the shielding material for flat cables is cheaply producible spherical or by using a grain-like carbon particle as a conductive filler. Therefore, it can be made to flow through the shielding layer (metal thin film layer) of the grand line of a flat cable, and shielding material only by heated and pressurizing the glue line of the above-mentioned shielding material for flat cables in piles at a flat cable. Therefore, since the routing which makes a flat cable with shielding becomes easy and it can make at high speed when the shielding material for flat cables of this invention is used, a manufacturing cost becomes cheap. Moreover, since the fire-resistant filler contains in the glue line, the flat cable with shielding produced using the shielding material of this invention can be made to pass the fire-resistant trial of UL.

[0013] It pastes up on the surface of a flat cable, and the shielding material for flat cables of this invention is taken as a flat cable with shielding, in order to give a shielding function to a flat cable. That is, by inserting a flat cable inside the shielding material which folded in two as [become / the glue line of the shielding material for flat cables / inside], and was made the double fold, and heating and pressurizing from shielding material, the shielding material for flat cables and a flat cable are unified, and the flat cable with shielding excellent in the shielding property is produced.

[0014]

[Embodiment of the Invention] Hereafter, this invention is explained in detail, making a drawing reference. Drawing 1 is type section drawing having shown an example of the shielding material for flat cables of this invention. Drawing 2 is the ** type top view having shown an example of the flat cable with shielding of this invention. Drawing 3 is type section drawing of the flat cable with shielding of this invention, (a) drawing is a cross-sectional view in X-Y of drawing 2, and (b) drawing is type section

drawing having shown lamination. It is type section drawing having shown the lamination of the flat cable with shielding produced using the shielding material for flat cables of the drawing 4 former.

[0015] The shielding material 1 for flat cables of this invention As shown in drawing 1 , on one side of the electric insulation base materials 11, such as a PET film The thermoplastics which forms the metal thin film layers 12, such as vacuum-plating-of-aluminium film, and has heat-sealing nature on this metal thin film layer 12 to the resin constituent used as a principal component The conductive fillers 14, such as metal powder and carbon powder, The resin constituent which added the fire-resistant fillers 15, such as an aluminum hydroxide and a magnesium hydroxide, is used. The glue line 13 (henceforth conductivity and the fire-resistant glue line 13) which has an adhesive resin layer, i.e., conductivity, and fire retardancy by coating etc. is formed, and it considers as the supply shielding material 1 for flat cables.

[0016] And fire retardancy is also given to said conductivity and fire-resistant glue line 13 while conductivity is acquired by the conductivity and the fire-resistant glue line 13 of the shielding material 1 for flat cables by making the fire-resistant filler 15 contain the conductive filler 14 20 to 50% of the weight ten to 30% of the weight. Therefore, it can be made to flow through the metal thin film layer 12 of the grand line 21 of a flat cable 2, and the shielding material 1 easily through conductivity and the fire-resistant glue line 13 only by heating the conductivity and the fire-resistant glue line 13 of the above-mentioned shielding material 1 for flat cables in piles to a flat cable, and pressurizing. Therefore, when producing a flat cable with shielding using this shielding material, as compared with the conventional shielding material for flat cables, working capacity becomes very good and the product stabilized at high speed can be manufactured.

[0017] Namely, when a flat cable with shielding is produced using the shielding material for flat cables of this invention, Conductivity and the fire-resistant glue line 13 are carried out inside, the shielding material 1 for flat cables is folded in two, and a flat cable 2 is inserted into it. By the shielding material 1 for flat cables As shown in drawing 2 , by leaving and wrapping in a part for the terminal area of a flat cable 2, and heating, pressurizing and carrying out from the shielding material 1 side for flat cables, the shielding material 1 for flat cables and a flat cable 2 are unified, and the flat cable 3 with shielding is produced.

[0018] In this case, it flows through the metal thin film layer 12 of the grand line 21 of a flat cable 2, and the shielding material 1 for flat cables, and it is necessary to take a ground. Therefore, as shown in drawing 3 R> 3 (a), a part of flat cable insulating layer 23 of a flat cable 2 is excised, and the excision section 24 for a flow is formed. That is, since the flat cable insulating layer 23 consists of PET film 23a and insulating glue line 23b as shown in drawing 3 (b), it excises a part of this bilayer, and forms the excision section 24 for electric conduction. Next, since conductivity and the flame-retardant-resin layer 13 enter into the excision section 24 for a flow as by heating and pressurizing the shielding material 1 for flat cables in piles shows to the flat cable 2 which exposed a part of this grand line at drawing 3 (a), the grand line 21 and the metal thin film 12 flow through conductivity and the flame-retardant-resin layer 13 with conductivity.

[0019] In the case of the conventional shielding material, as shown in drawing 4 , a metallic foil is stuck on the electric insulation base material 11. glue-line insulating 13a On the metallic foil Since it has prepared, When this is pasted up on a flat cable 2 and the conventional flat cable 3 with shielding a is produced, In order to make it flow through metallic foil 12a of the grand line 21 of a flat cable 2, and shielding material excision section 24a both insulating glue line 13a of the flat cable insulating layer 23 (it consists of PET film 23a and insulating glue line 23b which are kicked to drawing 3 (b)), and the shielding material 1 -- the excision section 24 for a flow -- and it is necessary to prepare for a flow And in order to make it flow through metallic foil 12a of the grand line 21 and shielding material by spot welding using these excision sections 24 and 24a for a flow, the routing became complicated and the problem was in workability. That is, since working capacity was bad, productivity did not go up but the production cost was high.

[0020] Since the fire-resistant filler contains the shielding material 1 for flat cables of this invention in the conductivity and the fire-resistant glue line 13 of the electric insulation base materials 11, such as a PET film, not only an adhesive property but the shielding material 1 whole for flat cables becomes fire retardancy. Therefore, if a flat cable with shielding is produced using this shielding material 1 for flat cables, the product with which the flat cable with shielding passes the fire-resistant trial of UL will be obtained.

[0021] As thermoplastic synthetic resin which has the heat-sealing nature used for the shielding material for flat cables of this invention, hot melt system adhesives, such as a polystyrene system, a polyolefine system, a polyester system, and a polyamide system, a rubber system, an acrylic polyvinyl ether system, and silicone system adhesives can be mentioned. And these adhesives need to paste both a metal thin film layer and the outer layer insulating layer of a flat cable, where a conductive filler and a fire-resistant filler are contained. Hot melt system adhesives using polyester system resin as adhesives which suit this object are desirable. What consists of a resin constituent which uses as a principal component the polyester system resin whose

glass transition point are saturation copolymerized polyester resin and is -50-80 degrees C also in it and, whose weight average molecular weight is 7000 to 50000 is suitable for the hot melt system adhesives using the above-mentioned polyester system resin.

[0022] As a conductive filler used for the shielding material for flat cables of this invention, the glass fiber which performed alloy powders, such as metal powders, such as a carbon particle, nickel, copper, and silver, and a pewter, a metal whisker, and metal plating is mentioned. In the case of a carbon filler, the die length (or diameter) of the filler has desirable 0.1-5 micrometers which it is used in 0.1-20 micrometers, and is easy to distribute also in it. cheap [in this invention / in price] as a carbon particle, although there is a thing of the shape of a globular shape, a grain, and a flake and which needlelike and fibrous configuration -- the thing of the shape of spherical or a grain is desirable. And since the conductive glue line containing these conductive fillers needs to paste both a metal thin film layer and the outer layer insulating layer of a flat cable, it is selected from the above-mentioned heat-sealing nature thermoplastics as heat-sealing nature thermoplastics according to an application. As a content of a conductive filler, 10 - 30 % of the weight in the resin solid content when forming a conductive glue line is desirable.

[0023] As a flame retarder used as a fire-resistant filler of this invention, a chlorine system, a bromine system, etc. are raised as a halogenation flame retarder, for example. As a chlorine system, chlorinated paraffin, chlorinated polyethylene, chlorination Pori Fell, par chloro cyclo pentadecane, an anhydrous beef fat acid, chlorendic acid, etc. are raised. As a bromine system, tetrabromo ethane, tetrabromo butane, tetrabromobisphenol A (TBBA), Deca BUROMO diphenyloxide (DBDPO), a hexa BUROMO cyclo dodecane (HBCD), OKUTABUROMO diphenyloxide (OBDPO), Bisto RIBUROMO phenoxy ethane (BTBPE), Tribromophenol (TBP), an ethylene screw tetrabromo phthalimide, TBA polycarbonate oligomer, bromination polystyrene, TBA epoxy oligomer, The TBA bis-dibromopropyl ether, ethylene screw pen TABUROMO diphenyl, Organic compounds, such as poly BUROMO phenyl oxide, hexabromobenzene, decabromodiphenyl ether, a tetrabromo phthalic anhydride, a hexa BUROMO cyclo decane, and an ammonium bromide, or an inorganic compound is raised.

[0024] A phosphorus series flame retardant Red phosphorus, triaryl phosphate, alkyl allyl compound phosphate, Alkyl phosphate, dimethyl methyl phosphate, FOSUFORINETO, Halogen-containing condensed-phosphoric-acid ester, trimethyl phosphate, triethyl phosphate, Tributyl phosphate, REZORUJIRU bis-phosphate, trioctylphosphate, TORIBUTOKISHI ethyl phosphate, 2-ethylhexyl diphenyl phosphate, Tricresyl phosphate, cresyl phenyl phosphate, triphenyl phosphate (TPP), Tris (chloro ethyl) phosphate, tris-beta-chloropropyl phosphate, Tris (2, 3-dichloro propyl) phosphate, tris (2, 3-dibromopropyl) phosphate, Tris (BUROMO chloropropyl) phosphate, a screw (2, 3-dibromopropyl) 2, 3-dichloro propyl phosphate, Phosphoric ester or phosphorus compounds, such as screw (chloropropyl) mono-octyl phosphate, poly FOSUHONETO, poly phosphate, aromatic series phosphoric ester, aromatic series condensed-phosphoric-acid ester, and a dibromo NEOBEN chill glycol, are raised.

[0025] In addition, as an organic system flame retarder, there are polyol compounds, such as FOSUFONETO mold polyol, phosphate mold polyol, and halogen-containing polyol, etc. As an inorganic flame retardant, hydration metallic compounds, such as an aluminum hydroxide and a magnesium hydroxide, Antimony oxide, such as an antimony trioxide, antimony tetroxide, and antimony pentoxide, Boric-acid zinc, stannic-acid zinc, boric-acid antimony, a boric acid; Molybdic-acid antimony, Molybdenum compounds, such as a molybdic-acid ghost and molybdenum oxide, calcium-aluminum-silicate, A zirconium compound, a tin compound, a dawsonite, a calcium-aluminate hydrate, There are ferrocene sulfonic acid metal salts, such as zinc sulfide, ferrous oxide, oxidization copper, copper powder, a calcium carbonate, and a metaboric acid barium ferrocene, a nitric-acid metal salt, hydroxyquinoline Mn complex salt, a vanadium chloride, a silicone system polymer, etc. Various kinds of flame retarders, such as nitrogen content compounds, such as; guanidine compound, a triazine compound, a melamine SHIANU rate, and the Lynn-nitride, boletic acid, a maleic acid, isocyanurate, and a urea, can be used for others.

[0026] As a content of a fire-resistant filler, when adding a fire-resistant filler and a conductive filler together in a glue line, the content in resin solid content has 20 - 50 desirable % of the weight. Even if it uses electric insulation base materials, such as PET, by adding the above-mentioned fire-resistant filler in a glue line, 21 or more fire retardancy can be given by the oxygen index (JIS K7201-2). It is better to set an oxygen index as 25-35 preferably. When an oxygen index is less than 25, if the thickness of a flat cable base material is thick, fire retardancy may be insufficient for PET and it makes an oxygen index larger than 35 by the thickness of 38 micrometers or more, the addition of a flame retarder needs to make [many] it, the bond strength to a flat cable falls, and it becomes a problem. Therefore, the flat cable with shielding produced using the shielding material for flat cables can pass the fire-resistant trial (UL1581 1080 VW-1) of UL.

[0027] Moreover, in this invention, in order to adjust physical properties, such as the coating fitness of the above thermoplastics constituents, other additives can be added to arbitration. As other additives, a filler, a stabilizer, a plasticizer, an ultraviolet ray absorbent, lubricant, an antistatic agent, a coloring agent, and others can be used, for example. Specifically, extenders, such as a magnesium carbonate, an aluminum oxide, titanium oxide, and a zinc oxide, or white pigments, the powder of other inorganic compounds, a glass frit, fluororesin powder, polyolefine system resin powder, and others can be used.

[0028] Although a thing with flexibility and electric insulation, for example, various kinds of synthetic-resin films etc., can be used as an electric insulation base material used for this invention, a heat-resistant thing is especially desirable. As such an ingredient, polyethylene terephthalate, polyimide, polyamidoimide, polyester imide, polyphenylene sulfide, polyethylenenaphthalate, etc. can be mentioned. Especially in this invention, the film of polyethylene terephthalate is desirable in respect of a cost side or workability. 4-25 micrometers of thickness of the film of an electric insulation base material are usually 6-12 micrometers preferably.

[0029] In this invention, when the metal thin film prepared in the front face of an electric insulation base material forms a thin film, a conductive high thing can be used. Vacuum evaporation film, such as aluminum, silver, copper, and nickel, is suitable. Also in it, the vacuum-plating-of-aluminium film cheap especially in cost is desirable. In addition, in the case of a foil, although a metallic foil is sufficient as a metal thin film, since cost becomes high, it is necessary to choose according to needs. In this invention, the vacuum evaporation film of a merit is larger. A shielding property becomes high so that a metal thin film layer is thick, but if a metal thin film layer becomes thick too much, flexibility will fall and bending fitness and sliding nature will worsen. Moreover, what is satisfied with thickening of the vacuum evaporation film with 1 time and two vacuum evaporation is not obtained, but it is necessary to carry out vacuum evaporation processing, and becomes disadvantageous in cost 3 times or more. Although the formation approach of the vacuum evaporation film can use vacuum deposition, sputtering, a CVD method, etc., its vacuum deposition excellent in mass production nature is desirable. Although the thickness of a metal thin film can be used by 0.04-0.2 micrometers, it is 0.8-0.15 micrometers preferably. Less than 0.04 micrometers of the shielding effect as shielding material are [the thickness of the vacuum evaporation film] insufficient, and when the thickness of the vacuum evaporation film exceeds 0.2 micrometers, it is necessary to carry out vacuum evaporation processing 3 times or more, and becomes disadvantageous in cost.

[0030]

[Example] Hereafter, this invention is explained to a detail based on an example.

(Example 1) As shown in drawing 1, as an electric insulation base material 11, the vacuum-plating-of-aluminium film with a thickness of 0.1 micrometers was formed as a metal thin film layer 12 on the polyethylene terephthalate (PET) film with a thickness of 12 micrometers, conductivity and the fire-resistant glue line 13 (33 micrometers in thickness after desiccation) were further formed using the hot melt adhesive of the following presentation on the vacuum-plating-of-aluminium film, and the film-like shielding material 1 for flat cables was produced. Hereafter, the shielding material 1 for flat cables of the shape of this film is only called shielding film 1.

[0031] Presentation polyester system resin of hot melt adhesive Granular 60-% of the weight carbon (particle size of 0.1-1.0 micrometers) 15-% of the weight bromine system flame retarder 10-% of the weight antimony trioxide 5-% of the weight aluminum hydroxide What mixed the resin solid content 40 weight section of the 10-% of the weight above-mentioned presentation, and the solvent 60 weight section (partially aromatic solvent (methyl-ethyl-ketone 50% and toluene 50%)).

[0032] The surface-electrical-resistance values of the conductivity and the fire-resistant glue line 13 of the obtained shielding film were 5ohm/**. Moreover, fire retardancy was an oxygen index 28. Thus, the manufactured shielding film was able to be rolled round in the shape of a roll, and was able to be transported. Using this shielding film, carry out conductivity and a glue line 13 inside, and this shielding film is folded in two. By inserting the flat cable 2 which formed the grand line, using a heating plate, heating and pressurizing from the front face of a shielding film, inside the shielding film 1 made the double fold. While pasting up conductivity and the fire-resistant glue line 13 on the grand line, the shielding film 1 and the flat cable 2 were carried out thermal melting arrival, it unified, and the flat cable 3 with shielding as shown in drawing 2 was produced. The obtained flat cable with shielding showed the perfect shielding effect. Moreover, the fire-resistant trial of UL was passed.

[0033]

[Effect of the Invention] Since the glue line of shielding material has conductivity and it can take easily,

when the grand line of a flat cable and the flow of the shielding layer (metal thin film) of shielding material heat shielding material to a flat cable and pressurize in case the shielding material for flat cables of this invention produces a flat cable with shielding using this shielding material, a routing becomes easy and production speed improves, a manufacturing cost becomes cheap. Moreover, since the fire-resistant filler is also contained together with a conductive filler in the glue line, the obtained shielding material has fire retardancy and the flat cable with shielding produced using this shielding material can pass the fire-resistant trial of UL. Furthermore, since the shielding material for flat cables of this invention uses a PET film for an electric insulation base material and the vacuum-plating-of-aluminium film is used for a shielding layer, it excels in flexibility dramatically and the flat cable with shielding using this shielding material becomes the thing excellent in the sliding property.

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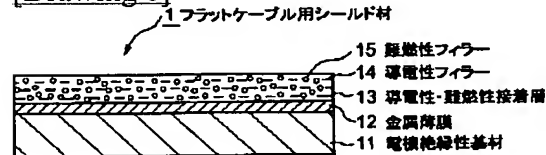
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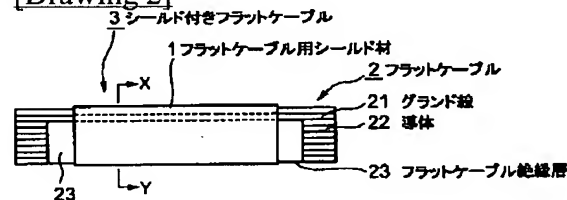
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DRAWINGS

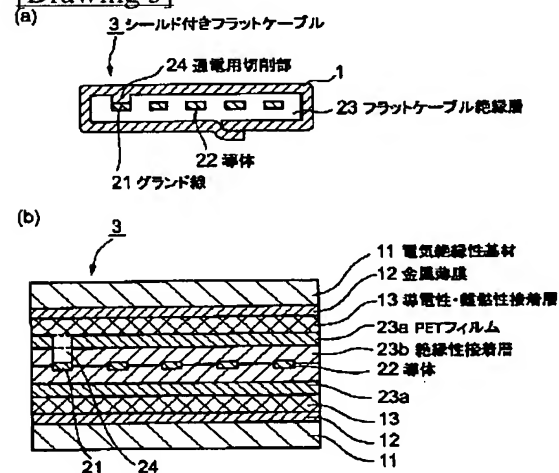
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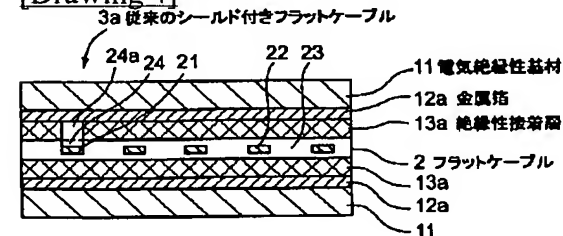
[Drawing 2]



[Drawing 3]



[Drawing 4]



[Translation done.]